

PROJECT NUMBER: 1620
PROJECT TITLE: Electrophysiological Studies
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I. NASAL EVENT-RELATED POTENTIALS (NERPs)

A. Objective: To develop methods by which to objectively and reliably evaluate human responses to cigarettes, smoke constituents and tobacco flavorants.

B. Results:

1. Cognitive NERP Study

Pilot experiments to investigate the basic parameters necessary for recording cognitive NERPs have been initiated with the goal of utilizing these responses to discriminate differences among flavors. Current efforts are focusing on the isolation of the cognitive component of the NERP. Utilizing six second inter-stimulus-intervals (ISIs), experiments are being conducted comparing NERPs when target stimuli are presented sequentially vs when presented randomly in the cognitive paradigm. NERPs to target stimuli in the cognitive paradigm should contain a cognitive component that is not present in the NERPs to target stimuli presented sequentially. To date, it is possible to record responses at six second ISIs using an A/D converter and software furnished by G. Kobal. However, due to problems in the transferring of data into the EPA database, it is currently not possible to retrieve the NERP waveforms for manipulation and evaluation. This problem is currently being investigated by S. Peterson and should be corrected very soon.

Developmental Engineering has begun work on the programming of a reaction time task to be utilized during the cognitive NERP experiments. The task will allow for a signal detection analysis of data gathered from these experiments. Once completed, the program will allow the data from the psychophysical task to be gathered and tagged to the appropriate NERP waveforms under the new ISI conditions.

2. Topographical Mapping Study

More extensive statistical analyses of the data from this study are being conducted in order to compare the findings with results obtained in the Concentration/Response Study. To date, repeated measures analyses of variance have been completed for all NERP waveform measurements (latency and amplitude) comparing left and right nostril NERP data in response to stimulation with vanillin, CO₂, amyl acetate and a mixture of vanillin and CO₂. Post hoc comparisons are currently being conducted for all significant main effects and interactions in order to further examine the sources of the significant differences. All analyses should be completed by early November.

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3. Other Work

Work aimed at determining optimal cleaning methods for materials which might be employed in the yet-to-be-designed olfactometer/smoke delivery system continues. Preliminary investigations conducted with Teflon tubing found the tubing to be contaminated (i.e., smelling of smoke) following a single 50cc, 2.0 second puff of cigarette smoke, suggesting that all subsequent puffs would be contaminated with smoke from the previous puff. Additionally, the results indicated that Teflon is quite permeable to smoke condensate. That is, following cleaning with solvent, tubings appeared to remain clean for only a short period of time before the smoke odor returned, indicating that the smoke was not only contaminating the inner surface of the tubing but penetrating into the Teflon. Most efficient cleaning was accomplished by continuously flushing the tubings with acetone for an interval of time relative to the dimensions of the tubings, followed by continuously sweeping with gas until time for the tubings to be used again. These findings suggest that Teflon is a viable candidate for use in the new smoke delivery system only if the tubings can be changed or efficiently cleaned following one puff of cigarette smoke.¹ Investigations are currently being conducted to repeat these tests using glass and stainless steel.

C. Plans: Following resolution of the problem in transferring data into the EPA database, plans are to continue pilot investigations aimed at isolating the cognitive component of the NERP. Included in these investigations will be experiments employing two different intensities of the same stimulus, with the high intensity stimulus serving as the target stimulus and the low intensity stimulus, the standard stimulus. The NERP to the high intensity (target) stimulus should contain a cognitive component not found in the NERP to the low intensity (standard) stimulus. Following isolation of the cognitive component of the NERP, experiments will be initiated to systematically manipulate ISIs in order to better understand the mechanisms by which flavor discriminations are made.

D. References:

1. Hayes, C.; Hellams, R. Cleaning of Smoke-Contaminated Teflon Tubing. Memo to F. Gullotta; 1987 October 6.

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